

TITLE OF INVENTION

B at T w r Hinge and Footer Assembly

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] Not Applicable

5 STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR
DEVELOPMENT

[0002] Not Applicable

BACKGROUND OF THE INVENTION

1. Field of Invention

10 **[0003]** This invention pertains to a hinge assembly and cooperating footer for
boat towers. More particularly, this invention pertains to the hardware used for
folding a boat tower, such as one used to pull a wakeboarder or skier. The
hardware includes a hinge assembly that operates when a spring-loaded pin is
retracted. The hardware also includes a footer that is used to secure an
15 attachment point of the tower to the boat. The footer includes a spring-loaded pin
that secures a tower post to the footer, which is attached to the boat.

2. Description of the Related Art

[0004] A popular recreational activity is to water ski or ride a wakeboard. A
powerboat pulls a person on skis or a wakeboard, which, at an appropriate speed,
20 allows the person to remain above the water. A pull-rope is towed by the
powerboat and has a handle grasped by the person.

[0005] Powerboats employ various means for attaching the pull-rope to the
boat. One means is a post located amidships that has a pull-rope attachment
point above the gunwales. Another means is to use a tower that extends from the
gunwales, over the cockpit, with a pull-rope attachment point at an elevated point
25 on the tower. Because of the forces involved in pulling one or more persons behind
a boat, the attachment point for the pull-rope must be structurally sound.

[0006] An example of such a boat tower is disclosed in United States Patent Number 6,044,788, entitled "Water Sports Performance System and Method," by Larson, et al., on April 4, 2000. This patent discloses a boat tower that can be rotated from an upright position to a lowered position having less overall height, thereby aiding in towing the boat and passing underneath low bridges. The tower is attached to the boat with pinned connections. The pins are removed from the aft connections and the tower rotates about the pins of the forward connections. This arrangement requires that the pins be removed from the connections, resulting in loose parts that must be stored. Also, the removal of the pins, depending upon their configuration, requires the use of tools.

[0007] It is an objective of this invention to provide means for folding or lowering a boat tower without having to use tools or maintain and store loose parts removed to fold the tower.

BRIEF SUMMARY OF THE INVENTION

[0008] According to one embodiment of the present invention, a folding tower with a pair of hinge assemblies and a pair of releasable footers is provided. Each hinge assembly includes two mating members that pivot about a center-point. The two mating members are secured together by a pair of spring-loaded retractable pins, or bolts, that engage openings in the mating members. When retracted, the pins release the mating members, allowing them to pivot relative to each other.

[0009] Each releasable footer is attached to a surface and has an opening with a spring-loaded retractable pin protruding into the opening. An insertable member has an opening that is engaged by the spring-loaded pin such that when the insertable member engages the footer opening, the spring-loaded pin engages the insertable member opening, thereby securing the insertable member to the footer.

[0010] In another embodiment, the folding tower has a pair of hinge assemblies and the tower end opposite the hinge assemblies has a releasable connection, thereby allowing the tower to fold after being released.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0011] The above-mentioned features of the invention will become more clearly understood from the following detailed description of the invention read together with the drawings in which:

5 Figure 1a is a side view of a powerboat with one type of a tower;

Figure 1b is a side view of a powerboat with a second type of a tower;

Figure 2 is a perspective view of one embodiment of a hinge assembly;

Figure 3 is a view of the hinge assembly in a partially folded position;

Figure 4 is a cross-sectional view of half of the hinge assembly;

10 Figure 5 is a cross-sectional view of the other half of the hinge assembly;

Figure 6 is an isometric view of one half of the hinge assembly;

Figure 7 exploded perspective view of the footer;

Figure 8 is a cross-section view of the footer;

Figure 9 is an exploded view of the pin and insertable member;

15 Figure 10 is a perspective view of another embodiment of the hinge assembly;

Figure 11 is an exploded cross-sectional view of the embodiment of the hinge assembly illustrated in Figure 10;

20 Figure 12 is a perspective view of the embodiment of a second hinge member illustrated in Figure 10;

Figure 13 is an exploded view of the embodiment of the hinge operator mechanism illustrated in Figure 10; and

Figures 14a and 14b are cross-sectional views illustrating the normal and actuated position, respectively, of the operator mechanism illustrated in Figure 10.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Apparatus for folding a boat tower is disclosed. The configuration of boat towers varies considerably. However, the need to easily reduce the height of the tower is a commonly felt need. Further, the need to be able to manipulate the tower without tools or loose parts is a commonly felt need. Toward this end, a boat tower is provided with hinges on one side and releasable connections on the other.

[0013] Figures 1a and 1b illustrate two embodiments of boat towers for towing skiers and wakeboarders. Those skilled in the art will recognize that various configurations of towers can be used without departing from the spirit and scope of the present invention. Not illustrated are means for securing the wakeboards or skis to the sides of the towers. The towing tower **106** illustrated in Figure 1a has a first strut **112** in which each end of the first strut **112** attaches to the gunwales on one side of a boat **102** at a footer **120**, **122**. One end of the second strut **114** attaches to the aft footer **122** and the other end of the second strut **114** releasably attaches to the first strut **112**. The tower **106** has two first struts **112**, one on each side of the boat **102**. There are also two second struts **114**, one for each first strut **112**. Each of the first struts **112** may be connected with one or more cross- struts that typically follow the contours of the windshield **104**. Each of the second struts **114** is connected with one or more cross- struts. One of the cross- struts connecting the two second struts **114** has a pull-rope connection point **116** located inline with the center of the boat **102**.

[0014] The tower **106**, in the lowered position, is illustrated in Figure 1a in phantom. To lower the height of the tower **106**, the second struts **114** are released from their connection to the first struts **112** at a releasable connection **118**. A hinge assembly **110** is then unlocked, permitting the second struts **114** and associated cross- struts to pivot aft such that the pull-rope point **116** is brought toward the aft deck of the boat **102**. With the hinge assembly **110** properly located, the upper portion of the tower **106** has a much lower height when folded than when it is in its normal, ready to use position.

[0015] Figure 1b illustrates a second configuration of a towing tower **106'**. In this configuration, a pair of first struts **132** are attached to the gunwales, but

does not provide structural support to the second struts **134**. The first struts **132** typically have a cross-strut that follows the contours of the windshield **104**. Each pair of second struts **134** attach to a forward footer **124** and an aft footer **126**.

The attachment to the aft footer **126** is a releasable connection. The second struts
5 **134**, in the illustrated configuration have a structural strut **136** and one or more cross- struts, to one of which the pull-rope point **116** is attached.

[0016] The tower **106'**, in the lowered position, is illustrated in Figure 1b in phantom. To lower the tower **106'**, the aft end of the second strut **134** is released from the aft footer **126** and the hinge assembly **110** is unlocked to permit the
10 second strut **134** to fold toward the bow of the boat **102**. With the hinge assembly **110** properly located, the upper portion of the tower **106'** has a much lower height when folded than when it is in its normal, ready to use position.

[0017] The novel design of the hinge assembly **110** and footer **126** presented herein allows the user to fold the tower **106**, **106'** without resort to tools. In other
15 words, the present invention permits the tower **106**, **106'** to be quickly folded by manipulating the tower **106**, **106'** by hand, with no loose components or screws that are separate from the tower components.

[0018] Figure 2 illustrates one embodiment of the hinge assembly **110** in its locked position, which in the illustrated embodiment, is an extended position in
20 which the two ends **204**, **214** are diametrically opposite. The hinge assembly **110** performs the function of pivoting one portion of the tower **106**, **106'** relative to the other, such as when folding the tower **106**, **106'**. The hinge assembly **110** includes two mating halves, or members, **202** and **212**. Each half **202** and **212** has a protrusion **204** and **214** adapted for receiving tubing, which is welded in
25 place. Each half **202** and **212** includes an operator **208** and **218** used for locking the hinge assembly **110** in the locked position. The operator **208** and **218** moves longitudinally in the slotted opening **206**.

[0019] Figure 3 illustrates the hinge assembly **110** in the unlocked position in which the two halves, or members, **202** and **212** are free to rotate about a pivot
30 point. The two halves **202** and **212** rotate approximately 135 degrees in either direction, relative to each other.

[0020] Figure 4 is a cross-section of the first half, or first member, **202** of the hinge assembly **110**, which aids in understanding the construction and operation of the hinge assembly **110**. A spring **402** and a bolt **404** are inserted into an opening **406** and the operator **208** screws into the bolt **404**, thereby capturing the
5 bold **404** in the opening **406**. Moving the operator **208** longitudinally along the slotted opening **206** causes the bolt **404** to slide along the opening **406**. The spring **402** causes the bolt **404** to have a normally extended position in which a portion of the bolt **404** extends from the end of the first half **202**. With the hinge assembly **110** in the locked position, the bolt **404** in the extended position engages
10 an opening **516** (seen in Figure 5) in the second half **212**. In the illustrated embodiment, the bolt **404** is a cylindrical bar with rounded ends.

[0021] Moving the operator **208** longitudinally towards the pivot point **412** causes the bolt **404** to retract such that no portion of the bolt **404** extends from the end of the first half **202**. The slotted opening **206** serves to restrain the
15 longitudinal movement of the operator **206** and, consequently, the bolt **404**.

[0022] Figure 5 is a cross-section of the second half, or second member, **212** of the hinge assembly **110**. The second half **212** has an opening **516** to receive the portion of the bolt **404** that extends from the first half **202**. The second half **212** has a second bolt, spring, and operator (not illustrated) that correspond to those of
20 the first half **202**.

[0023] Illustrated in Figure 5 is a pivot bolt **518**, which passes through the second half **212** and engages a threaded hole **412** on the first half **202**. The pivot bolt **518** has a shoulder **514** that passes through an opening **510** in the second half **212**, and the pivot bolt **518** has a head **516** that engages a shoulder in a wider
25 opening **508** in the second half **212**. The threaded part **512** of the pivot bolt **518** engages the blind threaded hole **412** on the first half **202** and the pivot bolt **518** is tightened such the bolt shoulder **514** rests against the first half **202**. In this tightened position, the head **516** of the pivot bolt **518** has a slight clearance with the shoulder of the wider opening **508**, thereby allowing the second half **212** to
30 freely rotate about the pivot bolt **518**, with the bolt shoulder **514** and the opening **510** serving as a bearing.

[0024] Figure 6 illustrates one half **212** of the hinge assembly **110** in an isometric view. The slot **524** for engaging the lip **302** of the other half **202** is shown. Above the slot **524** is the chamfer **306** adjacent the opening **516** for receiving the exposed end of the bolt **404**.

5 **[0025]** Each half **202** and **212** has a lip **302** and **502** that engages a slot **424** and **524** in the other half **212** and **202** when the hinge assembly **110** is in a locked position. The strength of the hinge assembly **110** in the locked position is a combination of the pivot bolt **518**, the bolts **404** pinning the two halves **202** and **212** together, and the lips **302** and **502** engaging the slots **424** and **524**. In one
10 embodiment, the two halves **202** and **212** are made of aluminum, and the other components are made of stainless steel. Because of the marine environment to which the hinge assembly **110** is exposed, these materials have the advantage of being corrosion resistant, while still having sufficient strength for their application.

[0026] Each half **202** and **212** has two chamfers **304** and **306** located on
15 opposite sides of the opening **406** and **506**. The chamfers **304** and **306**, in combination with the rounded ends of the bolts **404**, allow the hinge assembly **110** to be placed in the locked position without retracting the bolts **404**. As the two halves **202** and **212** are brought into alignment before reaching the locked position, the rounded end of the bolts **404** strike the associated chamfer **304** or
20 **306**, which causes the bolt **404** to be pushed into the opening **406** and **506** against the spring **402** pressure. After the bolts **404** are aligned with the openings **516** and **416**, the springs **402** push the ends of the bolts **404** into the openings **516** and **416**, thereby locking the hinge assembly **110** in the locked position.

[0027] Figure 7 is an exploded perspective view of a releasable footer **710**.
25 The footer **710** performs the function of releasably securing a portion of the tower **106**, **106'** to the boat **102**. The footer body **702** is attached to a surface of the boat **102** and has a protrusion **704** adapted for connection to a tower tube. A releasable member **714** fits into a first opening **716**. The footer operator **712** is connected to the footer bolt **708**, which has pressure applied to it by the footer
30 spring **706**. The first opening **716** has a weep hole **722**, which allows water to drain from the first opening **716**. The weep hole **722** extends from the side of the

body **702** to the bottom of the first opening **716**. In one embodiment, the weep hole **722** is a drilled hole.

[0028] Figure 8 illustrates a cross-sectional view of the footer body **702**. The illustrated embodiment has three threaded openings **804a**, **804b**, and **804c** with which the body **702** is secured to the boat **102**. Those skilled in the art will recognize that other attachment means, for example studs protruding from the body **102**, can be used without departing from the spirit and scope of the present invention. Additionally, those skilled in the art will recognize that the number of attachment points on the base of the body **702** can vary without departing from the spirit and scope of the present invention.

[0029] Figure 9 illustrates the spring **706**, the footer bolt **708**, the footer operator **712**, and the releasable member **714**. In the illustrated embodiment, the releasable member **714** has an end that fits into the first opening **716** and an opposing end that is adapted to mate with a section of flattened tower tubing. Those skilled in the art will recognize that the angle between the two ends of the releasable member **714** can vary without departing from the spirit and scope of the present invention. In another embodiment, the releasable member **714** fits into the first opening **716** and does not have an opposing end for connecting to the tower tubing, rather, it is cut flush with the top surface of the footer body **702**. This embodiment is suitable for a footer without an attached strut, such as when a tower **106**, **106'** is removed from a boat **102**.

[0030] A bored hole **802** through a portion of the body **702** is for inserting the footer spring **706** and footer bolt **708**. A countersunk opening **718** intersects the bored hole **802**. The countersunk opening **718** receives the footer operator **712**, which, in the illustrated embodiment, is a screw with a shoulder **904**. The shoulder **904** moves within the slotted opening **806**. The footer bolt **708** slides along the bored hole **802** and one end of the footer bolt **708** engages the slot **902** in the releasable member **714**. The footer spring **706** pushes the bolt **708** into the slot **902**. To release the releasable member **714**, the footer operator **712** is slid away from the releasable member **714**, thereby retracting the footer bolt **708** from the slot **902** in the releasable member **714** and allowing the releasable member

714 to be removed from the first opening **716**. The illustrated embodiment shows the slot **902** as a rectangular opening cut into the releasable member **714**; however, one skilled in the art will recognize that the slot **902** can be any shaped opening adapted to receive the footer bolt **708** without departing from the spirit and scope of the present invention. For example, in one embodiment, the slot **902** is a hole bored or drilled in the releasable member **714**. In still another embodiment, the hole has a chamfered edge to aid in the alignment of the footer bolt **708** with the hole.

[0031] To secure the releasable member **714**, the footer operator **712** is slid away from the first opening **716** such that the footer bolt **708** is retracted into the bored hole **802** and does not extend into the first opening **716**. The releasable member **714** is then placed in the first opening **716** with the slot **902** orientated toward the bolt **708**, and the footer operator **712** is released, thereby allowing the footer spring **706** to push the footer bolt **708** into the slot **902**.

[0032] Figure 10 illustrates another embodiment of the hinge assembly **110'** in its locked position. The hinge assembly **110'** is operated by pressing a pushbutton **1002** located on the axis of the pivot point of the hinge assembly **110'**. Pushing the pushbutton **1002** allows the two members **202'** and **212'** to rotate relative to each other. A fastener **1004** secures the pushbutton **1002** to the internal portion of the hinge operator. The illustrated embodiment shows a pushbutton **1002** that fits into a circular opening **1102**. Those skilled in the art will recognize that pushbuttons **1002** and their corresponding openings **1102** can have other shapes without departing from the scope and spirit of the present invention.

[0033] Figure 11 illustrates the embodiment of the hinge assembly **110'** shown in Figure 10. The pushbutton fastener **1004** fits into an opening **1108** in the pushbutton **1002**. The fastener **1004** fits into the opening **1128** in the shaft **1126** of the locking assembly **1122**. The bottom of the pushbutton **1002** engages a spring **1110** that rests in an opening **1102**, which is on the outside surface of the first member **202'**.

[0034] Figure 12 is a perspective view of the second member **212'**. The locking assembly **1122** fits into the recess **1134** in the second member **212'**. The rotating lock plate **1112** fits into the round recess **1132** in the second member **212'**. The shaft **1126** of the locking assembly **1122** has a sliding fit with the opening **1118** in the shaft **1116** of the rotating lock plate **1112**. The shaft **1116** of the rotating lock plate **1112** has a sliding fit with the opening **1104** in the first member **202'**. The locking assembly **1122** has two locking pins, or bolts, **1124** parallel to the shaft **1126**. Those skilled in the art will recognize that the number of locking pins can vary without departing from the scope and spirit of the present invention. In the discussion of this embodiment of the hinge assembly **110'**, the two locking pins, or bolts, **1124** are called locking pins **1124** to avoid confusion with the bolts **404** discussed in the other embodiment of the hinge assembly **110**. However, one skilled in the art will recognize that whether the device is called a locking pin **1124** or a bolt **404**, the device serves to lock the first member **202**, **202'** and second member **212**, **212'** in a fixed, locked position. The locking pins, or bolts, **404**, **1124** are elongated members that engage corresponding openings **516**, **1106**. With one end of the locking pins, or bolts, **404**, **1124** secured and the other end of the locking pins, or bolts, **404**, **1124** engaging the corresponding opening **516**, **1106**, the locking pins, or bolts, **404**, **1124** shear strength prevents movement between the first member **202**, **202'** and second member **212**, **212'**.

[0035] Figure 13 is an exploded view of the operator for the embodiment illustrated in Figure 10. The rotating lock plate **1112** has four countersunk holes **1302** for receiving four fasteners **1304**. These fasteners **1304** secure the flange of the rotating lock plate **1112** to the second member **212'** by engaging threaded openings **1136** in the second member **212'** (illustrated in Figure 11). Those skilled in the art will recognize that the number of fasteners **1304**, along with the corresponding openings **1136** and **1302**, may vary without departing from the scope and spirit of the present invention. The secured rotating lock plate **1112** holds captive the locking assembly **1122**, which has locking pins **1124** sliding through the openings **1312** in the rotating lock plate **1112**.

[0036] Figures 14a and 14b are cross-sectional views illustrating the normal and actuated position, respectively, of the operator mechanism illustrated in Figure

10. In the normal position illustrated in Figure 14a, the spring **1110** pushes the pushbutton **1002** away from the first member **202'**, thereby forcing the locking pins **1124** to engage the corresponding openings **1106** in the first member **202'** and locking the first member **202'** to the second member **212'**. In the actuated position illustrated in Figure 14b, the pushbutton **1002** compresses the spring **1110**, pushes the locking assembly **1122** away from the first member **202'**, and disengages the locking pins **1124** from the openings **1106** in the first member **202'**. In the actuated position, the shaft **1116** of the rotating lock plate **1112** rotates within the opening **1104** in the first member **202'**, thereby allowing the first member **202'** to rotate, or pivot, relative to the second member **212'**

[0037] The embodiment of the hinge operator illustrated in Figures 10 to 14b operates to lock the hinge assembly **110'** in the locked position by the spring **1110** pressure forcing the locking pins **1124** into the openings **1106** in the first member **202'**, thereby fixing the first member **202'** in relation to the second member **212'**. With the hinge assembly **110'** in the locked position, the locking pins **1124** engaging the corresponding openings **1106** in the first member **202'** function to prevent the two members **202'** and **212'** from rotating about the pivot point, which is centered on the longitudinal axis of the pushbutton **1002**, and from the two members **202'** and **212'** moving apart from each other along their longitudinal axis. The rotating lock plate **1112**, in cooperation with the locking pins **1124** on the locking assembly **1122**, function to fix the locking pins **1124** to the second member **212'**. The lips **302** and **502** engaging the corresponding slots **424** and **524** function to strengthen the hinge assembly **110'** in the locked position. This strengthening is accomplished by restraining the freedom of movement of the two members **202'** and **212'** relative to each other, other than about the pivot point. The spring functions to force the locking pins **1124** to engage the corresponding openings **1106** in the first member **202'**.

[0038] Depressing the pushbutton **1002** forces the locking assembly **1122** away from the first member **202'** and disengages the locking pins **1124** from the openings **1106** in the first member **202'**. The pushbutton **1002** and spring **1110** function to force the locking pins **1124** out of engagement with the openings **1106** in the first member **202'**. The shaft **1116** cooperating with the opening **1104** in

the first member **202'** function as a pivot, allowing the first and second members **202'** and **212'** to pivot about each other with the corresponding surfaces of the shaft **1116** and the opening **1104** functioning as a bearing.

[0039] From the foregoing description, it will be recognized by those skilled
5 in the art that a folding tower **106, 106'** utilizing a pair of hinge assemblies **110**
and releasable feet **126** have been provided. The tower is adapted to be folded
without resort to tools, thereby resulting in the boat **102** having less height above
the waterline.

[0040] One embodiment of the hinge assembly **110** has first and second
10 members **202** and **212** that pivot about a pivot bolt **518**. Each member **202** and
212 has a spring-loaded bolt **404** that, in the extended position, engages an
opening **516** and **416** in the other member **212** and **202**, thereby locking the two
members **202** and **212** in fixed relation in the locked position. Each member **202**
and **212** also has a lip **302** and **502** and a corresponding slot **524** and **424**. The
15 lip **302** and **502** of each member **202** and **212** engages the slot **524** and **424** of
the other member **212** and **202** when the hinge assembly **110** is in the locked
position. Each member **202** and **212** has a chamfer **304** and **306** adjacent the
opening **406** and **506** that receives the bolt **404** from the other member **212** and
202. The chamfer **304** and **306** engages the bolt **404** and forces it into the
20 member **202** and **212**, thereby allowing the members **202** and **212** to lock without
requiring operator intervention to retract the bolts **404**.

[0041] Another embodiment of the hinge assembly **110'** has first and second
members **202'** and **212'** that pivot about a shaft **1116** and the opening **1104** in
the first member **202'**. The first member **202'** has an opening **1102** into which a
25 spring **1110** and a pushbutton **1002** fit. The pushbutton **1002** is connected to a
locking assembly **1122**, which has locking pins **1124** that engage openings **1106**
in the first member **202'** when the hinge assembly **110'** is in the locked position.
The locking assembly **1122** and the locking pins **1124** are restrained in the second
member **212'** by a rotating lock plate **1112** having openings **1312** that receive the
30 locking pins **1124**. The rotating lock plate **1112** is secured to the second member
212'. The first and second members **202'** and **212'** have lips **302** and **502** and

corresponding slots **524** and **424** that function to strengthen the hinge assembly **110'** in the locked position.

[0042] Both of the illustrated embodiments of the hinge assembly **110** and **110'** utilize a hand operated mechanism that is captive with the hinge assembly **110** and **110'**. The captive operator mechanism allows the hinge assembly **110** and **110'** to be taken out of the locked position without removing any component or using a tool.

[0043] Both of the illustrated embodiments of the hinge assembly **110** and **110'** include components that function to pivot portions of the tower **106, 106'**. In the embodiment illustrated in Figures 2 to 6, these components include the first member **202**, the second member **212**, and the pivot bolt **518** rotatably coupled to the opening **510** in the second member **212**. In the embodiment illustrated in Figures 10 to 14b, these components include the first member **202'**, the second member **212'**, and the shaft **116** of the lock plate **1112** rotatably coupled in the opening **510** in the first member **202'**.

[0044] Both of the illustrated embodiments of the hinge assembly **110** and **110'** include components that function to lock the pivoting portions of the tower **106, 106'**. In the embodiment illustrated in Figures 2 to 6, these components include the spring **402** and the bolt **404**, which is secured by the opening **406** in the first member **202** and slideably engages the corresponding opening **516** in the second member **212**. In the embodiment illustrated in Figures 10 to 14b, these components include the locking pins **1124** which are secured to the second member **212'** and slideably engage the openings **1106** in the first member **202'**.

[0045] Both of the illustrated embodiments of the hinge assembly **110** and **110'** include components that function to operate, or move, the locking mechanism of the pivoting portions of the tower **106, 106'**. In the embodiment illustrated in Figures 2 to 6, these components include the operator **208**, which is guided by an opening **206** in the first member **202**. In the embodiment illustrated in Figures 10 to 14b, these components include the pushbutton **1002**, which moves within an opening **1102** in the first member **202'** and causes the locking assembly **1122** to retract the locking pins **1124** from the openings **1106** in the first member **202'**.

[0046] The footer includes a footer body **702**, a releasable member **714**, and a spring-loaded footer bolt **708** with a footer operator **712**. The footer bolt **708** slides along a bored hole **802**. In the direction towards the first opening **716**, the bolt **712** is forced by a footer spring **706**, and in the opposition direction, the bolt

5 **708** is moved by a footer operator **712**

[0047] While the present invention has been illustrated by description of several embodiments and while the illustrative embodiments have been described in considerable detail, it is not the intention of the applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages

10 and modifications will readily appear to those skilled in the art. The invention in its broader aspects is therefore not limited to the specific details, representative apparatus and methods, and illustrative examples shown and described.

Accordingly, departures may be made from such details without departing from the spirit or scope of applicant's general inventive concept.